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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/806,202	03/23/2004	Hiroki Yoshikawa	119162	1944

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EXAMINER	
ROSASCO, STEPHEN D	
ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 12/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/806,202	YOSHIKAWA ET AL.	
	Examiner	Art Unit	
	Stephen Rosasco	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) *35-55* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/23/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

In response to applicant's election with traverse of Group I in the reply filed on 9/29/06, the examiner withdraws the restriction requirement and will examine claims 1-55.

Applicant's election with traverse of Group I (claims 1-34) in the reply filed on 9/29/06 is acknowledged. The traversal is on the ground(s) that the subject matter of all of claims 1-55 is sufficiently related that a thorough search for the subject matter of any one of claims 1-55 would encompass a search for the subject matter of the remaining claims; and that the search and examination of the entire application could be made without serious burden. And applicant cites the MPEP passage that reads - even though the application includes claims to independent or distinct inventions.

This is not found persuasive because Group I covers the composition of a mask and mask blank, a method of forming the blank and mask. Group II recites limitations as to the adjustment of the discharge power of the sputtering apparatus in order to control the composition of the blank. These are obviously issues that are diverse enough that the examiner feels that the searches do not completely overlap in that a search of a blank with certain layer compositions, does not completely overlap with a search for control parameters of a sputtering apparatus, and that therefore, there is an undue burden.

The requirement is still deemed proper and is therefore made FINAL.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 5-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Angelopoulos et al. (6,858,357).

Angelopoulos et al. (see especially claims 1-35, and col. 3, lines 56+) teach that the initial thin film can be deposited by sputter deposition (RF, DC magnetron, AC magnetron, pulsed bipolar DC magnetron, RF diode sputtering, or other sputter deposition methods familiar to those skilled in the art) from either a single target of a composite material (Si.sub.1-x Ti.sub.x, with x in the range 0.01 to 0.5) or two or more targets of different compositions (for example, Si.sub.3 N.sub.4 and Ti targets, or Si.sub.1-x Ti.sub.x and Ti targets). Variation in composition of the composite targets or individual variation of power and deposition time of the pure targets produces changes in film composition. Reactive sputtering with nitrogen and oxygen provides further capability to adjust the relative compositions of Si, Ti, and N and O, and thus the optical characteristics of the film. The substrate stage can be either stationary or planetary for the single target, and planetary for the multitarget with rotation speed adjusted accordingly.

And wherein the sputter target is made of a mixture of metal silicide and silicon.

Claims 5-7 are taught (col. 3, lines 55+) - Reactive sputtering with nitrogen and oxygen provides further capability to adjust the relative compositions of Si, Ti, and N and O, and thus the optical characteristics of the film. The substrate stage

can be either stationary or planetary for the single target, and planetary for the multitarget with rotation speed adjusted accordingly.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 4, 6 and 13-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Angelopoulos et al. (6,858,357) in view of Miyamura et al. (6,635,155) and Mitsui et al. (6,153,341).

The claimed invention is directed to a method of producing a phase shift mask blank wherein the method includes at least a step of forming one or more phase shift film on a substrate, and in the step, the phase shift film is formed by the sputtering method by simultaneously discharging at least one or more silicon target and one or more target selected from the group consisting of a metal silicide, a metal silicide oxide, a metal silicide nitride, a metal silicide oxide nitride, a metal silicide oxide carbide, a metal silicide nitride carbide, and a metal silicide oxide nitride carbide.

And wherein a composition ratio of metal and silicon in the phase shift film is changed by adjusting discharge powers applied to each target.

Claims 13-34 are taught - Angelopoulos et al. is included here as discussed above. Angelopoulos et al. also teach that by adjusting the oxygen to nitrogen, transmission as high as 20% can be achieved at 193 nm for film thickness

corresponding to 180 degree phase shift. Such wide transmission window provides the possibility of extending the operation wavelength down to 157 nm. FIG. 9 summarizes the film deposition conditions, optical properties (% T at 180 degree phase shift, n, and k), and the resulting composition obtained from RBS analysis.

The teachings of Angelopoulos et al. differ from those of the applicant in that the applicant teaches in claims 2, 4, 6, that the composition ratio of metal and silicon in the phase shift film is changed by adjusting discharge powers applied to each target; and in claims 3 and 7, that molybdenum is used as the metal in the target, and that a center value of a distribution of phase differences in the phase shift film to wavelength of light used in exposure is 180+-10 degrees, and a center value of a distribution of transmittances in the phase shift film is 3-40%.

Claims 2, 4, 6 are taught by - Miyamura et al. (col. 4, line 56 to col. 7); a method for forming an optical thin film having multiple optical layers on the surface of a substrate using a magnetron sputtering apparatus with a sputtering chamber having cathodes, the substrate, and at least two kinds of targets disposed therein.

Miyamura et al. also teach that by *controlling the discharge powers* to be supplied to the respective targets for simultaneous sputtering or the flow rates of the inert gas and the reactive gas, it is possible to form an optical thin film having the desired composition of each layer which have the desired optical constant.

And when a layer of a composite compound, such as a double oxide layer, a double nitride layer, a double boride layer, a double carbide layer, a silicon nitride layer or a boron nitride layer, is to be formed as an optical layer, in order to form such a composite compound layer, two or more targets made of different materials

corresponding to formation of such a layer, may be used to carry out sputtering simultaneously.

In such a case, by adjusting the distribution ratio of discharge powers among the plurality of targets, an optical layer having the desired composition and optical constant can be formed with good precision. Also in such a case, in the vicinity of the end point for formation of the optical layer, the layer forming speed may be slowed down by reducing the entire discharge power without changing the power ratio supplied to the targets, whereby the layer thickness can be controlled with high precision.

Claims 3 and 7 are taught by - Mitsui et al. (see col. 8, line 15+) a light translucent film made of a molybdenum silicon nitride (MoSiN system material) thin film was formed on a surface of a transparent substrate. This was for a phase shift mask blank for a KrF excimer laser (wavelength 248 nanometers). More specifically, using a mixing target (Mo:Si=30:70 mol %) of molybdenum (Mo) and silicon (Si), a molybdenum silicon nitride (MoSiN) thin film, whose thickness was 855 angstroms, was formed on the transparent substrate by reactive sputtering in a mixture gas atmosphere (Ar 10%, N.sub.2 90%, pressure 1.5.times.10.sup.-3 Torr) of Argon (Ar) and nitrogen (N.sub.2). The light transmission rate of the obtained phase shift mask blank at a wavelength of 248 nanometers was 2 percent. The phase shift amount (phase angle) f was about 180 degrees.

It would have been obvious to one having ordinary skill in the art to take the teachings of Angelopoulos et al. and combine them with the teachings of Miyamura et al. and Mitsui et al. in order to make the claimed invention because the advantages of the materials and method modifications are well known in the art, as

is the dependence of optical transmission on film material composition and thickness, and it would have been obvious to one in the art to adjust the film thickness to give the desired phase shift and optical transmission as that of claims 13-34.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Rosasco
Primary Examiner
Art Unit 1756

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11/28/06